Funded by the National Institutes of Health, USA.

Gene Expresssion Profile Analyses of

GUDMAP data includes both Bulk RNASeq and newly available

Single Cell Profiles

GUDMAP Data (Aronow, Potter)

www.gudmap.org

Entries Genes

All In Situ Hybridisation (ISH): 10758 3693

www.gudmap.org

Anti-Six2 Cytokeratin Six2 RNA probe



















Genitourinary Development Molecular Anatomy Project

GUDMAP

Editorial Office: Wong, F., Armstrong, J.F., Brennan, J., Lloyd-MacGilp, S., Davies, J.A. (University of Edinburgh).

Database and website development: Harding, S.D., Houghton, D., Haggarty, B., Roochun, Y., Baldock, R.A. (IGMM, University of Edinburgh).

Current GUDMAP Consortium Members: Hoshizaki, D. (NIH), Ahern, G.P. (Georgetown University), Aronow, B., Potter, S. (CCHMC, Cincinnati), Cohn, M.J. (HHMI, University of Florida), Jain, S. (Washington University in St. Louis), Keast, J. (University of Melbourne), Georgas, K. and Little, M.H. (University of Queensland), Mendelsohn, C. (Columbia University), Southard-Smith, E.M. (Vanderbilt

University), Vezina, C.M. (University of Wisconsin - Madison) & McMahon, A.P. (Keck School of Medicine, USC)

About GUDMAP

The GenitoUrinary Development Molecular Anatomy Project (GUDMAP) is an open access online resource developed by a consortium of laboratories working to provide the scientific and medical community with gene expression data, transgenic mice and tools to facilitate research and teaching.

GUDMAP data includes: Large-scale in-situ hybridisation screens, 3D OPT data, microarray gene expression data & sequencing data of the developing mouse genitourinary (GU) system. Expression data are annotated using a highresolution ontology specific to the developing murine GU system.

Initially, GUDMAP focussed on the murine GU system. More recently, GUDMAP has extended its focus to two new projects: Nociceptive GUDMAP (nGUDMAP) and Human GUDMAP (hGUDMAP). nGUDMAP focuses on nociceptors and associated cell types in pain processing of the murine urinary tract and pelvic region. hGUDMAP extends the gene expression data to include Human studies in bladder, urethra and kidney.

GUDMAP Data

Bulk RNASeq-

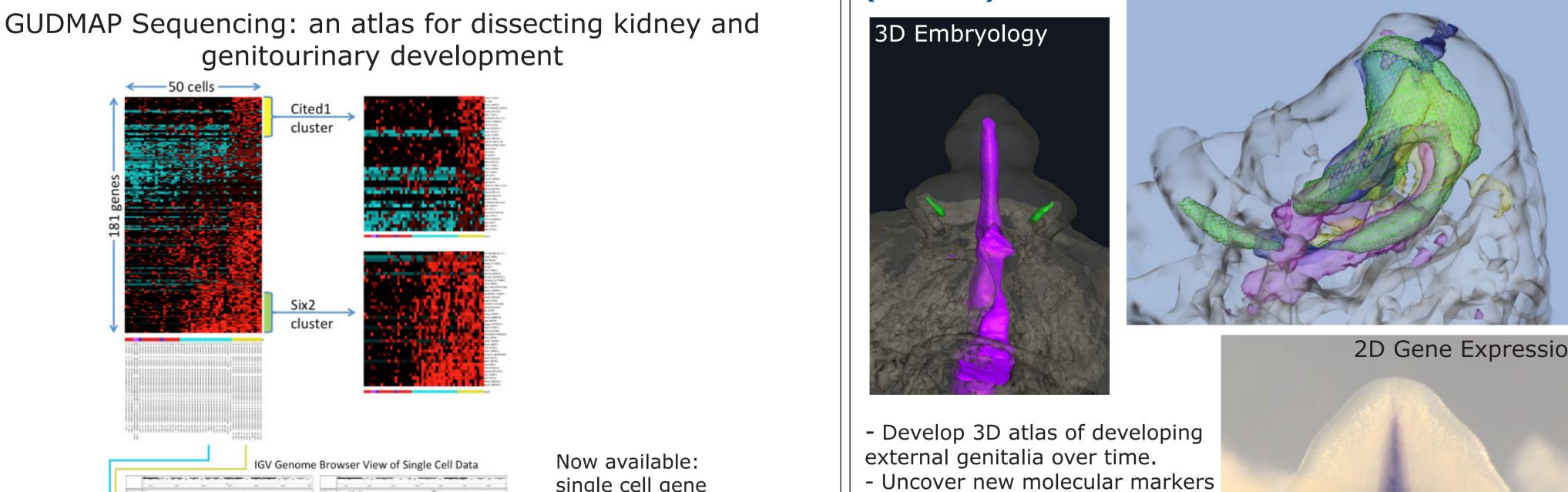
FACS-separate

Summary 'gene-strip' (below) provides an overview of expression data available for a gene. Links out to in-situ data & images, disease/phenotype associations and microarray expression

Gene Synonyms Disease Theiler Stage Expression Profile Expression Images Microarray expression profile Images Krt5 Krt2-5, Tfip8, 3300001P10Rik OMIM(6) TS17-28 View on UCSC View on IGV Section Profile Expression Images Microarray expression profile Images Microarray expression profile Images Microarray expression profile Images Images Microarray expression profile Images	aaca:									560
□ Krt5 Krt2-5, Tfip8, 3300001P10Rik OMIM(6) TS17-28 View on UCSC View on IGV		Gene	Synonyms	Disease	Theiler Stage		Expression Images	Microarray expression profile	RNA-SEQ	
		Krt5	Krt2-5, Tfip8, 3300001P10Rik	OMIM(6)	TS17-28					Mic

urothelium of bladder (EMAP:2860 muscularis mucosa of bladder (EMAP:28 ⊕ ⊕ submucosa of bladder (EMAP:32393) D detrusor muscle of bladder (EMAP:285 serosa of bladder (EMAP:28666) adventitia of bladder (EMAP:2883 Example of GUDMAP vasculature of bladder (EMAP:28) nerve of bladder (EMAP:31658 urachus (EMAP:12251) Urethra of female (EMAP:28752) urethra of male (EMAP:12309)





expression profile

analyses (E11.5

for endodermal cell types from

expression in developing genital

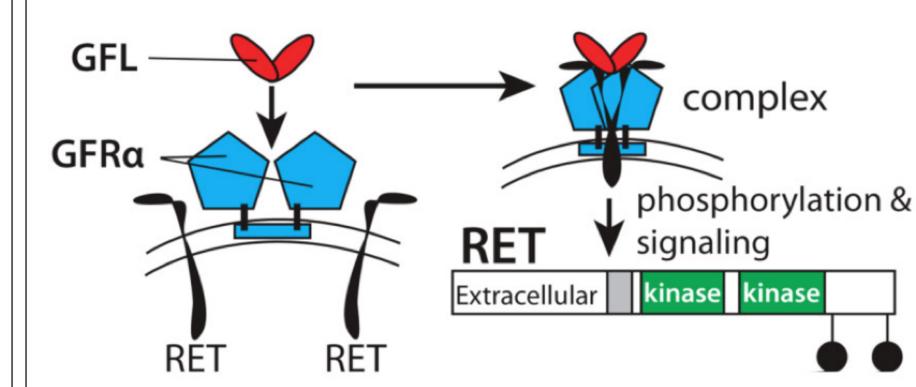
- Map 3D patterns of gene

tubercle to reference series.

urethral epithelium.

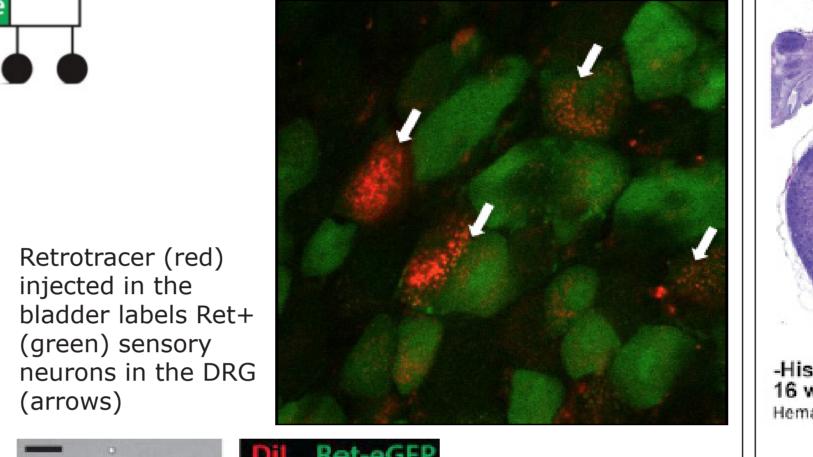
| Expression Profiles of Ret-positive DRG Neurons (Jain)

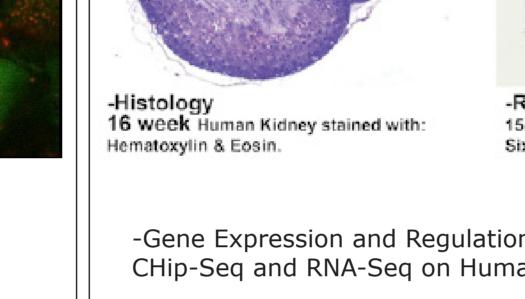
injected in the

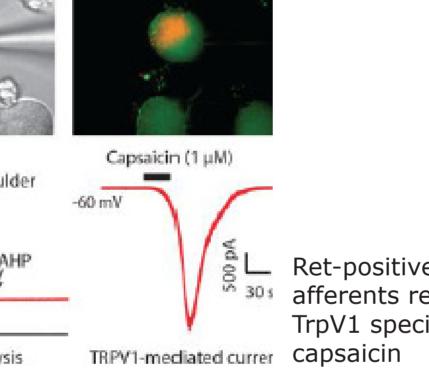


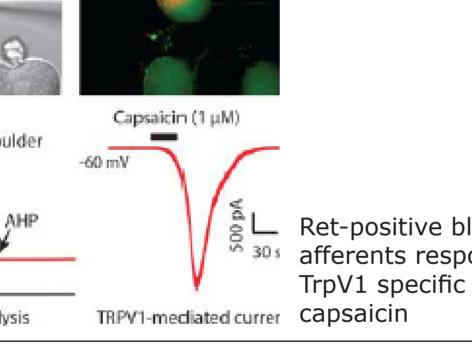
 GDNF family ligands signal through RET receptor tyrosine kinase.

 Major roles in neuronal survival and sensation.



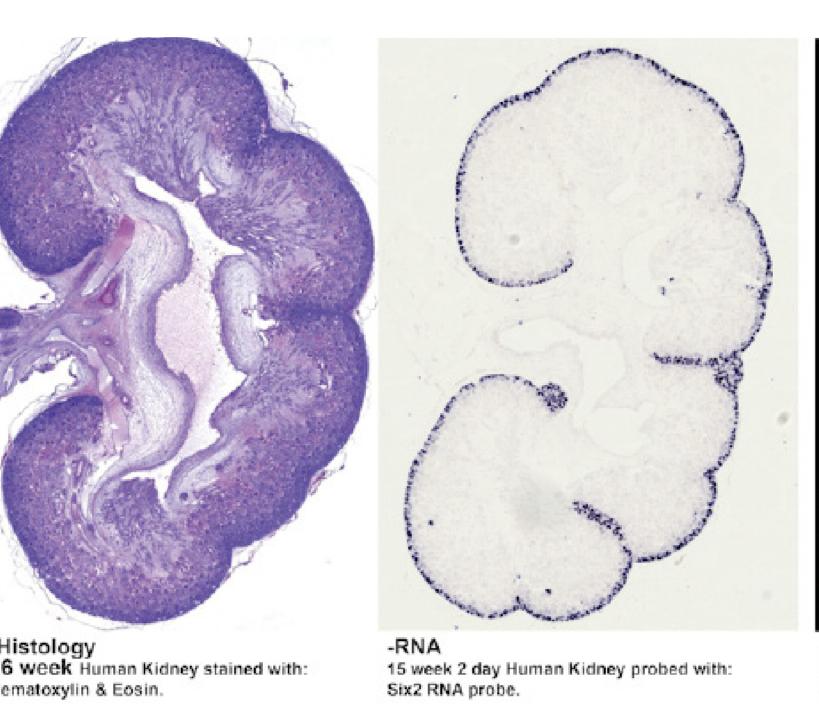


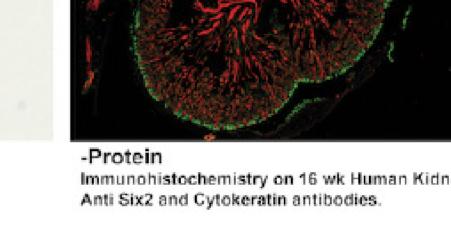


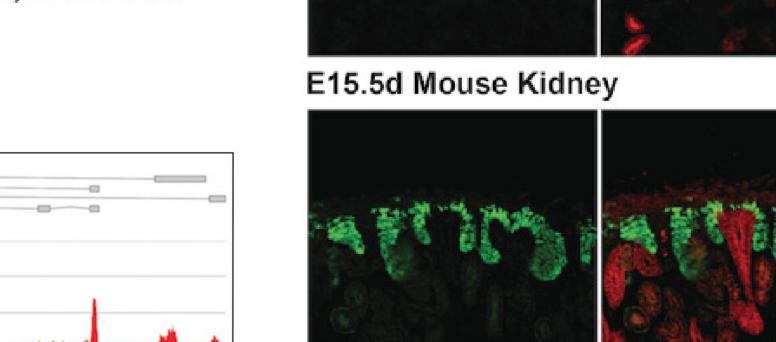


Ret-positive bladder 30s afferents respond to

Comparing Mouse and Human Kidney Development (McMahon)







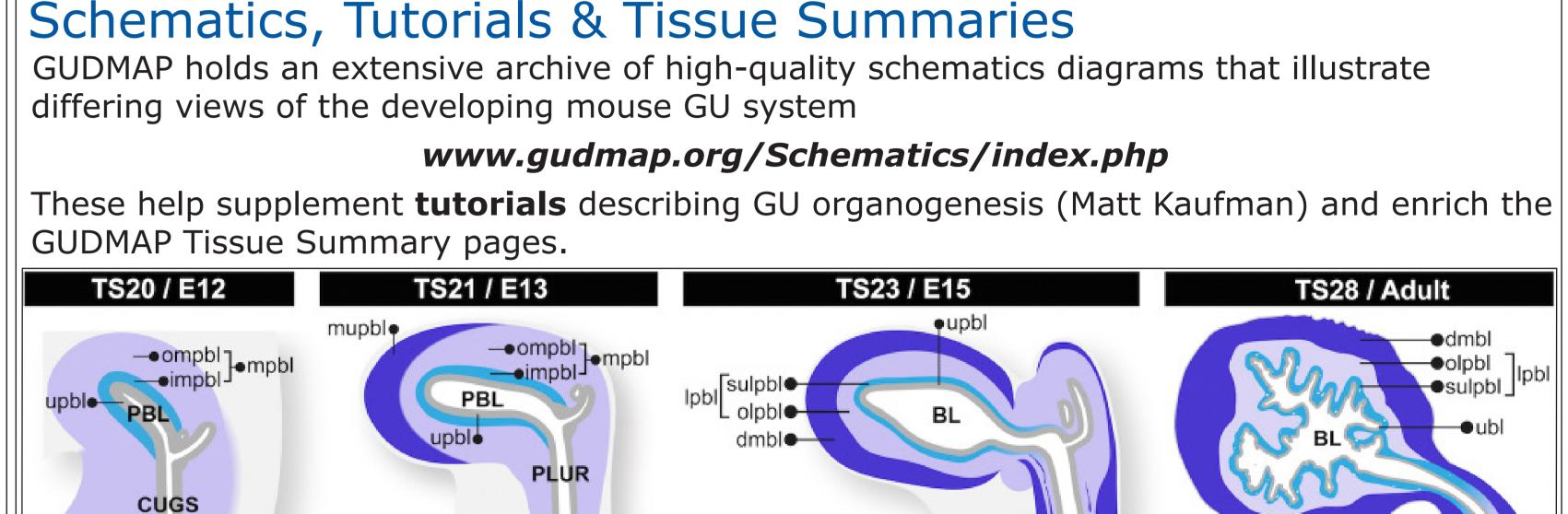
16 wk Human Kidney

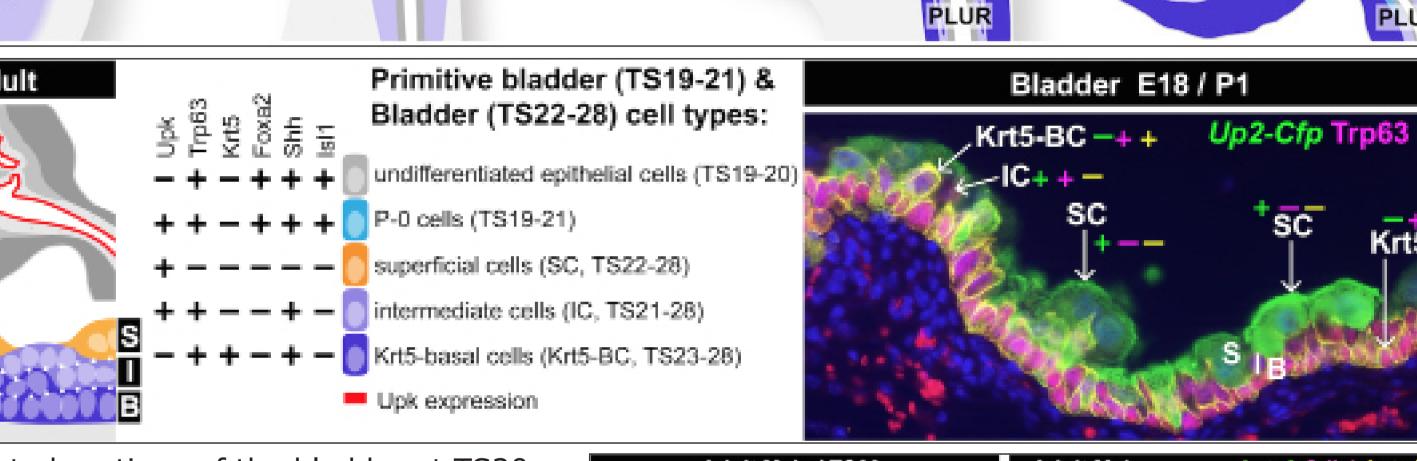
E15.5d Mouse Kidney

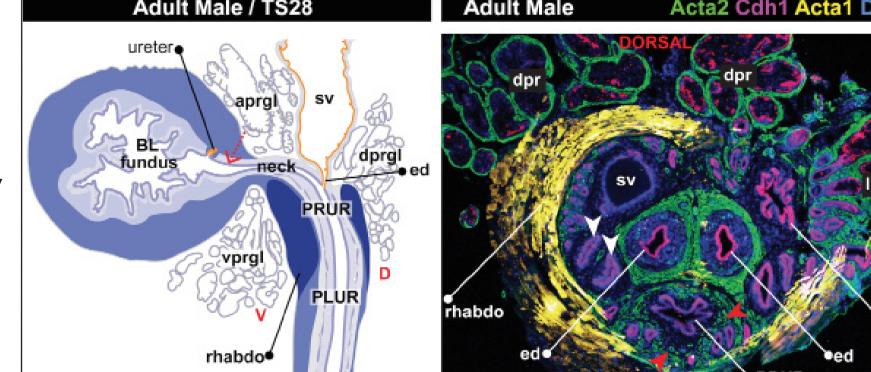
(12 dpc), TS21 (13 dpc), TS23 (15 dpc) and TS28 Middle: TS28 (adult) annotated section of the bladder with corresponding immunohistochemistry

Right: TS28 (adult) annotated section

of the male prostate with corresponding mmunohistrochemistry section.



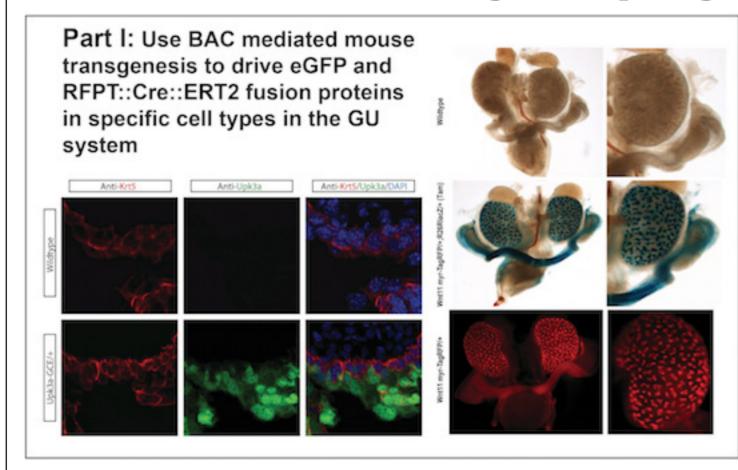


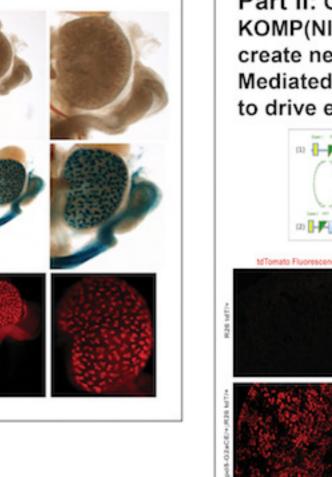


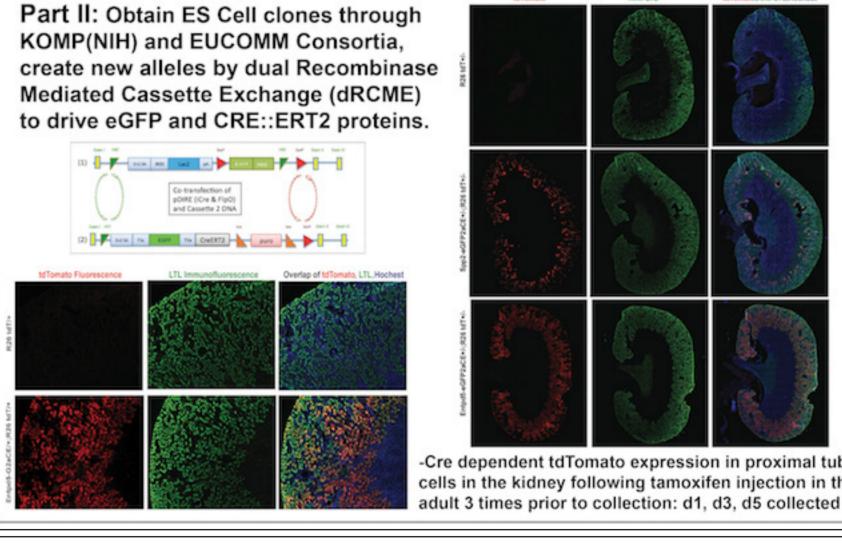


- To mark key cell populations in order to isolate, trace and modulate gene activity through drug inducible CRE recombinase.

- Encourage nominations of candidate loci from scientific community.
- Mice made available through the MMRRC (Jackson Labs).
- Nominate strains: www.gudmap.org/MS_GeneNoms.html



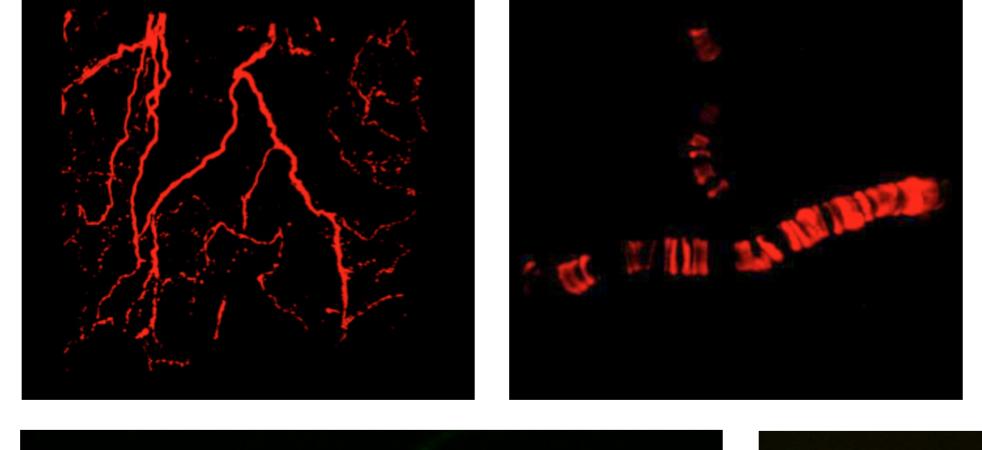




References All past contributors to GUDMAP can be found at www.gudmap.org/About/Projects/

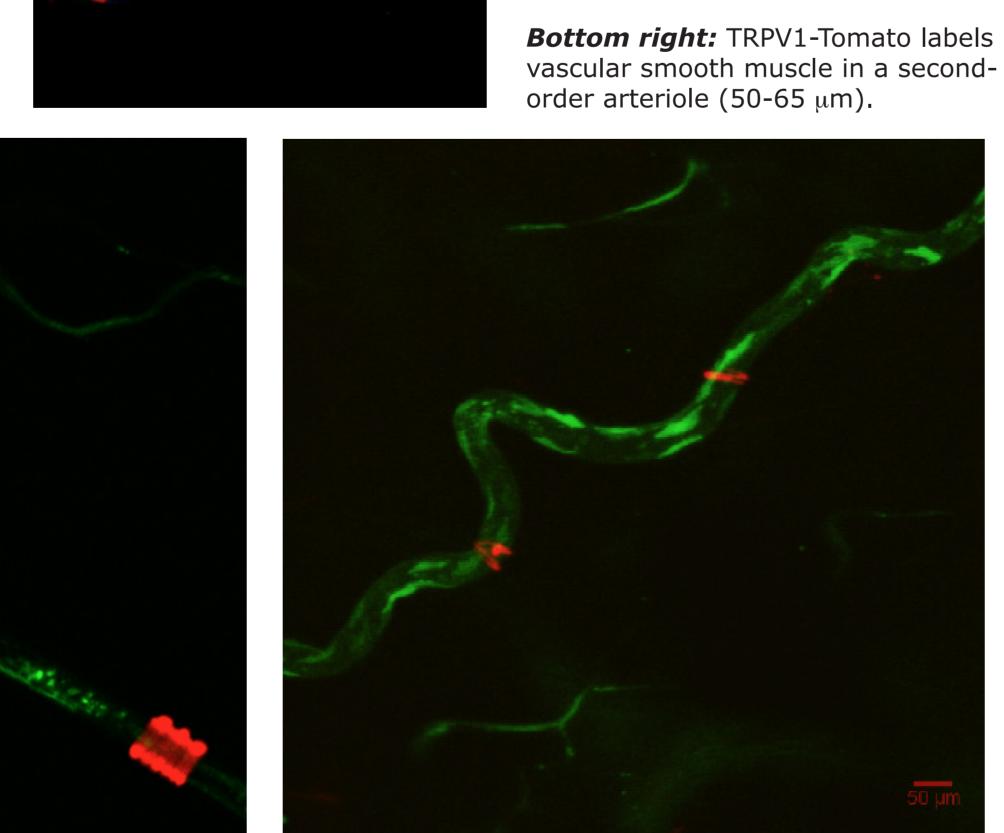
Harding SD et al. (2011). The GUDMAP database - an online resource for genitourinary research. Development. 138(13):2845-53 McMahon AP et al. (2008). GUDMAP: the genitourinary development molecular anatomy project. J. Am. Soc. Nephrology. 19(4):667-71 Little MH et al. (2007). A high-resolution anatomical ontology of the developing murine genitourinary tract. Gene Expr Patterns. 7(6):680-99 Ganghi D et al. (2013). Retinoid signaling in progenitors controls specification and regeneration of the urothelium. Dev. Cell. 26(5): 469-482.

Nociceptive Ion Channels in Bladder (Ahern)

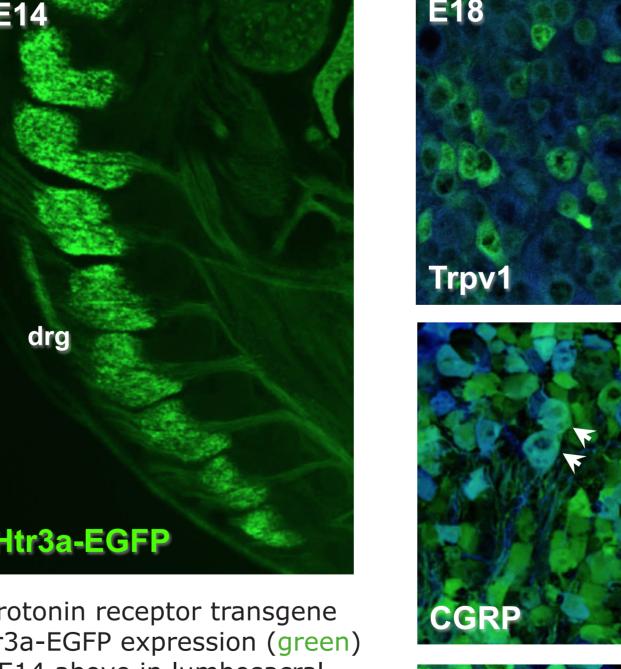


Ret-EGFP reporter mice show that Ret-positive fibers (green)

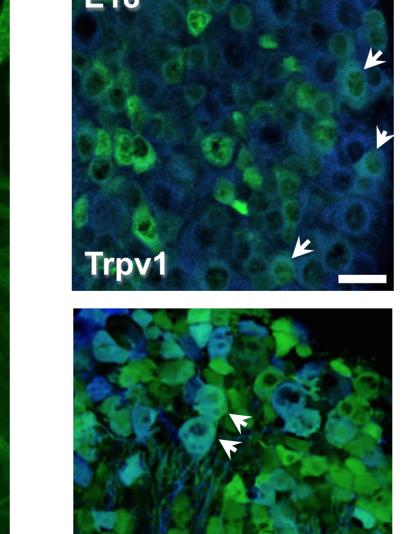
~95% of bladder nociceptive nerves. Right: TRPV1-Cre/Tomato labels vascular smooth muscle in a subset of bladder arterioles. order arteriole (25-40 μm).

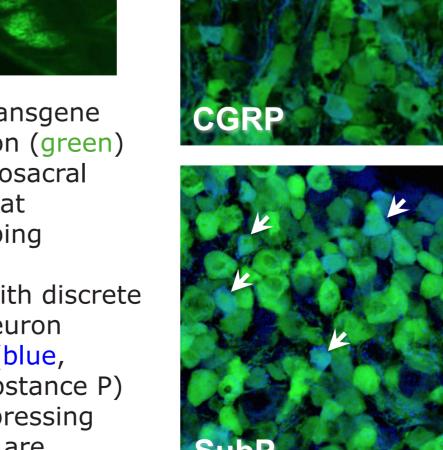


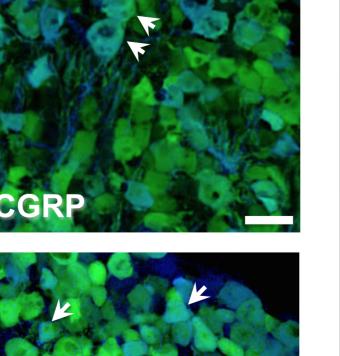
Mapping Serotonin Receptors | Comparing Innervation of Trigone/ in LUT Innervation (Southard- | Ureter/Urethral regions of LUT Smith)

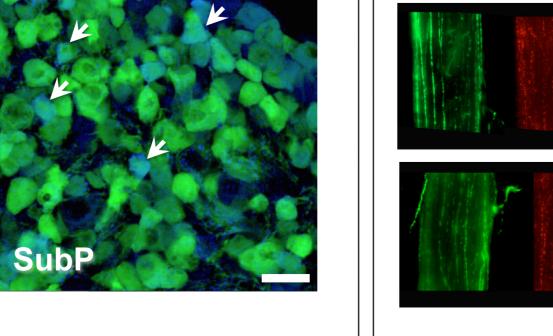


Serotonin receptor transgene Htr3a-EGFP expression (g at E14 above in lumbosacra dorsal root ganglia that innervate the developing bladder. Htr3a-EGFP co-localizes in DRG with discrete subsets of sensory neuron nociceptive markers (blue) Trpv1, CGRP, and Substance at E18. Some co-expressir cells that appear teal are Scale bar 25 µm

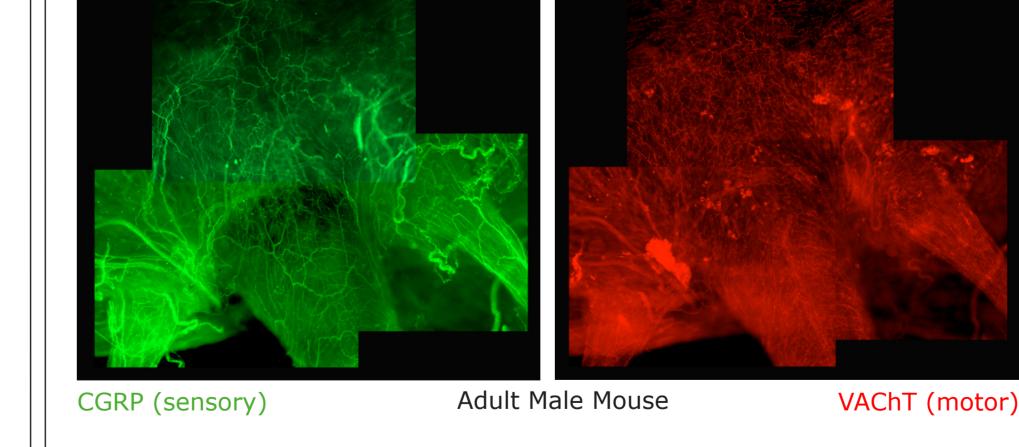


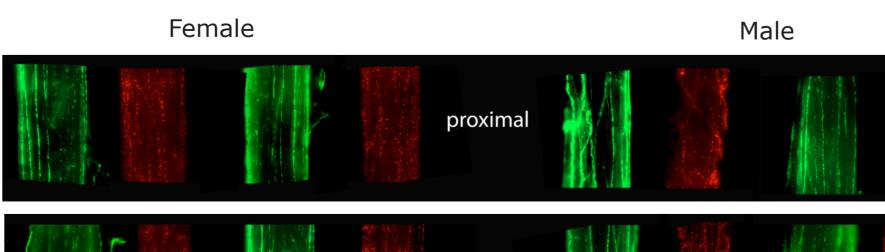






(Keast) Whole-mount preparations of ureter-trigone-urethra





Whole-mount preparations of ureter

CGRP (sensory) VAChT (motor)